UPPER TRISHULI-1 HEP (216MW)			
Client	**Nepal Water and Energy Development Company Private Limited**		
Owner's Engineer	**Tractebel Engineering GmbH / Jade Consult**		
REVIEW NOTE			
Contractor	**Doosan Heavy Industries & Construction Co., Ltd.**		
Title of the Document	Hydraulic calculation of diversion tunnel		
Document No.	UT1-C-010-CVL-DC-42001	Revision	0C
Date of Documents	19.01.2022	Received Date	19.01.2022
Transmittal Form No.	UT1-HEP-DHI-D-0119		
Previous Review Date/Status	06.01.2022/RR	Prev. Review Note No.	RN-0041
Review Note No.	**RN-0058**	**Present Review Date**	**22.02.2022**
		Present Review Status	**AN**
A: Approved AN: Approved as Noted RR: Returned for Resubmission FI: For Information, only.			

General Comments

The hydraulic calculation of diversion tunnel doc. ref.: *UT1-C-010-CVL-DC-42001 Rev.0C* has been submitted including the reply document RC-0014. However the reply document RC-0014 includes also reply comments to OE´s RN-0025 on Design Optimization Proposal for River Diversion Scheme including the cofferdams.

This review note RN-0058 only comments the document UT1-C-010-CVL-DC-42001_0C in technical aspects.

1 Analysis purpose

- It is understood that the expression "at this stage" means detail design of the project. However, with this expression it is still not clear if the 20-year dry season flood standard will be assumed for further calculations as well in future or it will be still changed.
- In RC-0014 reference is made to "chapter 3.2 of design optimization proposal – diversion works". As there are already existing many DOP documents regarding diversion works the corresponding document has to be specified in detail (codification, revision, date).
- If reference has to be made to another document, it has to be mentioned accordingly with complete document codification and title. The reference document has to be mentioned as well in chapter "2 Reference Documents".

2 Reference Documents

All reference documents including drawings (layout, cross/ -longitudinal sections) have to be mentioned.

3 Design criteria

- The hydrological analysis should be performed for only one period. Separating the months of November to April from May to October period should be avoided.

- The plotting of the 44 years period shows an extreme outlier for the highest flood. This flood value needs to be questioned and either be discarded or justified because it messes the entire analysis up.

- The correct design dimensions of each relevant structure have to be shown, e.g. crest elevations of cofferdams, cross- and longitudinal sections, including reference documents.

Chapters 4 to 6 Hydraulic formulars, discharge and characteristic water levels

- The flow equation: The flow equation that is used represents equation for the overflow. The equation that should be used for the free flow condition in the tunnel is the energy equation. With this equation the water level in the whole tunnel can be defined. Energy of the water at the outlet should be compared with the energy of the water in the riverbed, for checking if the hydraulic jump will occur inside the tunnel or if there is hydraulic jump at all.

- Pressure flow equation: According to the references stated in the report, used equation is defined for "Discharge rating curves for a valve discharging freely into air or into an enlarged, well-vented conduit can be developed from the equation". This is the quote from the reference. In the document there is an example for the calculation of the tunnel.

- For the calculation of the tunnel, pressurized or free flow, there should be a table were all relevant data (invert elevation, outlet elevation, upstream and downstream water levels, losses, etc.) should be presented for easier follow up and checking from the reviewer. The graphical presentation should be present as well.

DISCLAIMER

Any approval will not release the Contractor from any of his obligations under the Contract.

Sebastian Beck, Chief Design Engineer